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Chef and ARC — Two New Processing Tomato Varieties

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Chef and ARC — Two New Processing Tomato Varieties

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In 1971 the tomato-breeding program of the U.S. Department of Agriculture at Beltsville, Md., released Merit, Red Rock, and Potomac — three machine-harvestable processing varieties that were adapted to the Eastern United States. These and other recently developed varieties contributed to a trend by eastern tomato growers toward more mechanical harvesting in 1972.

In December 1972 the release of two additional tomato varieties — Chef and ARC — from the Beltsville research program was announced. Because of maturity differences, these varieties complement the earlier releases by enabling growers and processors to better schedule planting and subsequent harvesting. Like the 1971 releases, Chef and ARC have proved to be adapted to the mid-Atlantic States, but they may also be useful in other processing tomato-growing areas.

Pedigree

Chef is an F₇ generation selection whose pedigree is shown in figure 1. Chef was evaluated in trials as 70B131, 71B196, and 72B25. It originated from a cross between a medium early-maturing, highly crack-resistant, high-yielding line, with numerous lines and varieties of diverse origin in its parentage, and a Beltsville selection from a firm-fruited, jointless-pedicel line (FLA 1339D351DBK) received from the Florida Agricultural Experiment Station.

ARC is an F₉ generation selection that was evaluated as 70B850, 71B13, and 72B23. This variety is derived from a cross made in 1966 between a small-vined, late-maturing line, which produced a large number of firm, thick-walled, crack-

resistant fruits, and the machine-harvestable processing variety VFN 13L developed at the University of California, Davis. The pedigree of ARC is shown in figure 1.

Description

Chef and ARC are suited for mechanical harvesting because of the determinate growth habits of the vines, the concentrated setting ability, and the durability of the fruits (fig. 2). In order for the varieties to yield satisfactorily with a once-over mechanical harvest, recommended cultural practices must be followed. Chef and ARC have performed well either when direct field seeded or when transplanted, although ARC should only be

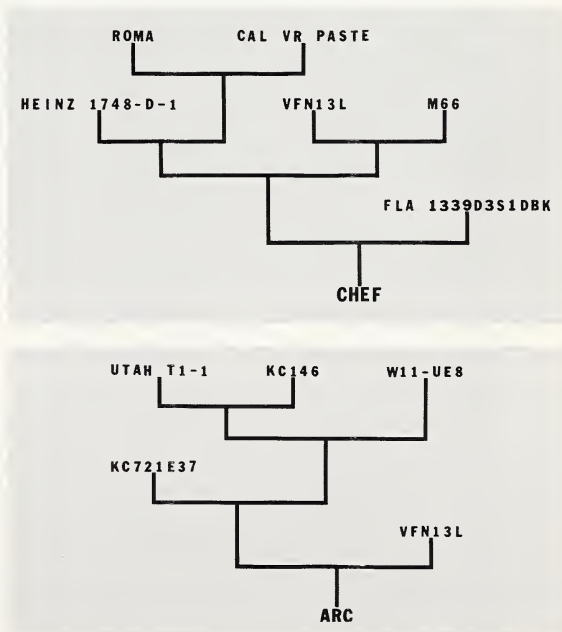


FIGURE 1. — Parentage of Chef and ARC tomato varieties.

¹ Breeding and development of the tomato lines through 1970 were done by R. E. Webb of this Laboratory. Appreciation is extended to W. B. Johnson, Rutgers University, for the data in table 2.



FIGURE 2. — Plants of Chef (above) and ARC (below) tomato varieties show they can ripen and hold a load of ripe fruit all at one time.

transplanted in areas with a short growing season because of its late maturity.

In laboratory studies using a thermogradient plate, 97 percent of Chef seeds germinated in 6 days and 95 percent of ARC seeds in 8 days at 65°F (18.5°C). At 59°F (15°C) Chef had 96 percent germination in 11 days and ARC had 90 percent in 15 days. With both varieties and at both temperatures germination was very concentrated and not spread over several days. Emergence from soil at these temperatures would take a few days longer.

In trial plantings the Chef fruits matured from 0 to 10 days earlier than Merit or C28. Approximately 95 days are required from transplanting to maximum yield for a once-over harvest and approximately 125 days from direct seeding to once-over harvest. ARC is a late-maturing variety that requires about 115 to 120 days from transplanting to harvest and 145 days from direct seeding to harvest.

Chef produces globe-shaped fruits weighing from 3 to 3.5 ounces (fig. 3). Since this variety possesses a jointless pedicel, the fruits are 95 to 98 percent stem free after being shaken from the vine (table 1). During 3 years' experience in machine harvesting this line, the fruits separated easily from the vine but did not shatter or drop prematurely. Chef fruits are a uniform green when immature and a deep red when mature. Once-over harvesting yields of 26.7 tons of usable fruits per acre have been attained in replicated trials (table 2), and yields of 23 tons per acre have been harvested in grower fields. Vine storage, or the ability of ripe fruit to remain sound on the vine, for Chef fruits is not as good as for some other varieties, but it is satisfactory for machine harvesting.

TABLE 1.—Average fruit weight, yield of usable fruit, and amount of stem retention following mechanical harvesting of Chef, ARC, and 4 check tomato varieties, Beltsville, Md., 1972

Variety	Weight	Yield		Stem retention
		per acre		
	Ounces	Tons	Percent	
Chef	3.1	21.1	2	
ARC	2.7	26.5	51	
Red Rock	3.4	22.5	11	
Merit	2.8	22.1	6	
Potomac	2.3	32.5	62	
C28	4.5	16.7	42	

TABLE 2.—Average fruit weight, yield of usable fruit per acre, and amount of usable fruit of Chef, ARC, and 2 check tomato varieties when transplanted and direct seeded in Rutgers University trials, Centerton, N.J., 1972

Variety	Weight	Transplanted		Direct seeded	
		Yield ¹ per acre	Usable fruit	Yield ¹ per acre	Usable fruit
	Ounces	Tons	Percent	Tons	Percent
Chef	3.2	21.9	75	26.7	82
ARC	3.8	25.4	64	28.2	72
Red Rock ..	3.5	25.3	84	16.2	49
C28	4.5	22.8	82	14.7	46

¹ Average of 4 replications.

ARC fruits are globe shaped and weigh between 2.5 and 3.5 ounces (fig. 3). Immature fruits are a uniform green; they do not have a dark-green shoulder. Because this variety lacks a jointless pedicel, up to 50 percent of the fruits may have stems attached following machine harvesting (table 1). ARC has yielded consistently well from season to season and from one growing area to another. In replicated trials, ARC has consistently yielded about 28.2 tons of usable fruits per acre (table 2) and in one trial as much as 38 tons. Yields of 25 tons per acre have been attained in grower fields.

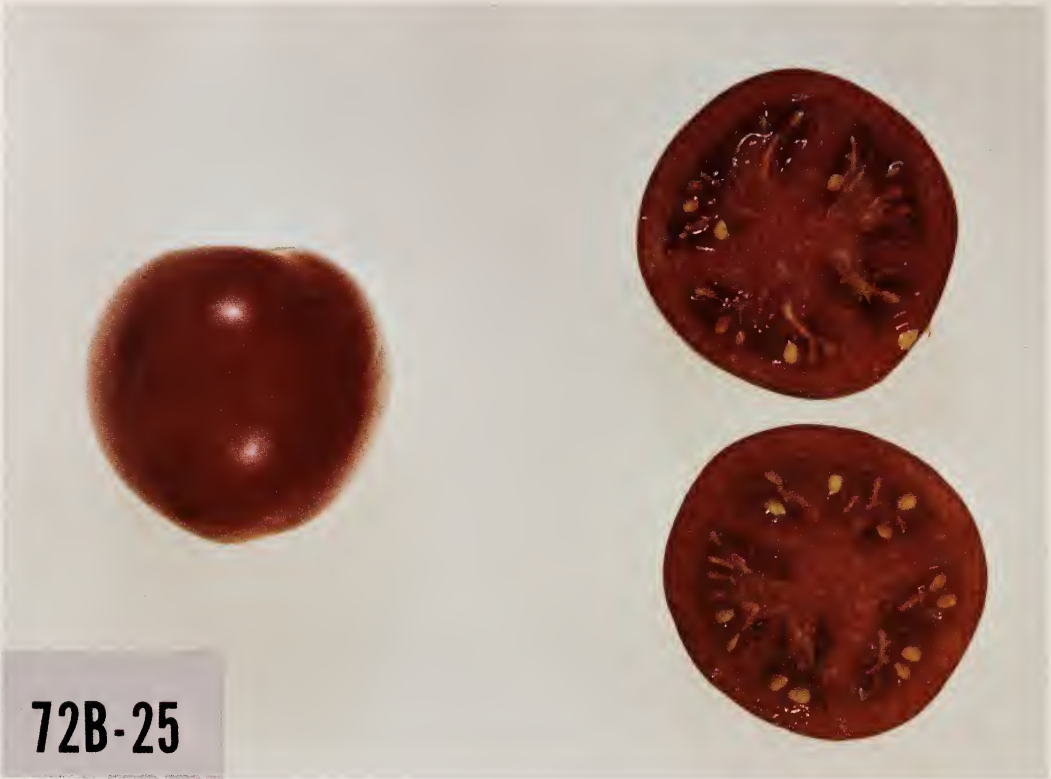
Disease Resistance

Chef and ARC are both resistant to race 1 of fusarium wilt, verticillium wilt, and gray leaf spot caused by *Stemphylium solani* Weber. In artificially and naturally inoculated field plots, ARC has proved to have medium to good tolerance against early blight caused by *Alternaria solani* (Ell. and G. Martin) Sor. Chef possesses low tolerance to early blight. Both have good crack and burst resistance, but Chef is slightly more prone to crack radially under adverse weather conditions.

Processing Quality

Laboratory and commercial production line evaluations have shown that Chef and ARC fruits have good processing qualities for concentrated products and juice. Table 3 contains data on the quality of the two varieties and three checks.

ARC and two of the check varieties had higher percentages of soluble solids in 1972 than in 1971, whereas Chef and Merit had the same readings in both seasons. Slightly higher solids readings were



72B-25



72B-23

FIGURE 3. — Fruits of Chef (above) and ARC (below) tomato varieties.

TABLE 3.—Laboratory quality data on raw juices of Chef, ARC, and 3 check tomato varieties grown at Beltsville, Md.

Year and variety	Soluble solids	Alcohol-insoluble solids	pH	Total acidity (citric)	Color a/b ¹	Ascorbic acid
<i>1971</i>	<i>Percent</i>	<i>Percent</i>		<i>Percent</i>		<i>Mg per 100 g</i>
Chef	5.7	—	4.30	—	2.37	—
ARC	5.9	—	4.35	—	2.34	—
Red Rock	5.1	—	4.20	—	2.32	—
Merit	5.3	—	4.35	—	2.30	—
Potomac	4.8	—	4.35	—	2.24	—
<i>1972</i>						
Chef	5.7	0.65	4.30	0.45	2.02	19
ARC	6.4	.34	4.20	.49	2.31	18
Red Rock	6.3	.35	4.30	.47	2.22	15
Merit	5.3	.25	4.35	.39	2.29	14
Potomac	5.8	.20	4.30	.47	2.45	14

¹ Measured by a Gardner Color Difference Meter.

predictable in 1972 because of the drier weather in late July and August. The color values for ARC remained the same for both years, but the pH of the variety was lower in 1972 than in 1971. On the other hand, the pH values for Chef remained the same for both years, but its fruits had poorer color in 1972 than in 1971.

The poorer color and the unchanged soluble solids reading for Chef in 1972 are attributed to smaller, more open vines caused by cool, wet growing conditions that prevailed at Beltsville early in the growing season. Since ARC is a larger vined and later maturing variety, it was less affected by the adverse weather in 1972. The amount of alcohol-insoluble solids, total acidity (citric), and ascorbic acid (vitamin C) was only measured in 1972.

The ARC variety when grown at close plant spacings and fertilized properly may produce fruits with a sufficiently small stem scar and in-

ternal core to be acceptable for use as an uncored whole tomato.

Adaptation

Chef and ARC have been tested in all the major processing tomato-producing areas of the country. Both varieties have proved in replicated and large-scale grower trials to be adapted to production in the mid-Atlantic States. In addition, ARC has yielded well in at least one trial in northwestern Ohio, and Chef has yielded well and demonstrated good earliness in a central California trial.

Seed Production

Seeds of Chef and ARC have been made available to the major vegetable seed-producing companies in the United States. Requests for seed should be directed to these companies.

Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.